SURVEY OF INSECT LOSSES

EASTERN LASSEN WORKING CIRCLE

LASSEN NATIONAL FOREST

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by

K. A. SALMAN
Agent
U. S. Bureau of Entomology

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TABLE OF CONTENTS

	Page
SUMMARY	1
INTRODUCTION	2
HISTORY OF THE AREA	2
SURVEY METHODS	3
DESCRIPTION OF THE AREA	3
GENERAL INSECT CONDITIONS	5
INSECT CONDITIONS BY UNITS	6
Crater Mountain Unit	6
Harvey Mountain Unit	7
Gordon Creek Unit	8
Cave Mountain Unit	9
McCoy Flat Unit	9
Brockman Flat Unit	10
Logan Mountain Unit	10
Supplementary Notes	10
DISCUSSION	11
FIGURE 1	12
FIGURE 2	13
TABLE I	14
TABLE II	15
MAP OF THE AREA	

Summary

1. The survey was made at the request of the Forest Service in order to supply information to be used in working out future logging plans for the Fruit Growers' Supply Company's sale area.

2. The area lies in the northeastern portion of the Lassen National Forest in the Bogard Ranger District. The timber cover is predominantly a mature, mixed yellow pine-Jeffrey pine type. Seventy-six thousand acres are timbered, carrying a volume of 859,036 M.B.M. of pine timber. Cutover areas are not included in this survey.

3. Check areas, strip cruises and strip count traverses were utilized in making an intensive survey of 4.7 per cent of the timbered area. Extensive survey methods were employed in surveying the remainder of the timbered area.

4. The infestation in general shows a slight tendency to increase, but is of a balanced endemic type, with smaller local areas experiencing heavier losses and exhibiting epidemic conditions. The western pine beetle and the Jeffrey pine beetle cause the more important losses.

5. The annual losses for 1929 and 1930 over the greater part of the area were less than 0.5 per cent of the stand. Smaller areas in nearly all units experienced losses of from 0.5 to over 2.0 per cent.

6. One group of areas, chiefly in the Brockman Flat and Cave Mountain Units, shows an infestation involving about 2.0 per cent of the stand. Apparently the insects are not attacking vigorously in these areas, but are favored by the poor conditions for tree growth. These infestations have apparently continued at the same rate for some years past, and do not seem to be spreading.

7. The Harvey Mountain Unit contains areas in which unstable conditions exist. Losses are near 2.0 per cent of the stand, and have been occurring at the same rate for some time. The infestation has many of the characteristics of an epidemic, is increasing and spreading, and should receive some attention.

8. It is suggested that some action, preferably one involving utilization of the timber, be taken to control the epidemic on the Harvey Mountain areas. Salvage of the timber on the other areas showing a heavy infestation should be attempted when possible.

SURVEY OF INSECT LOSSES
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Introduction

Insect losses in the Fruit Growers' Supply Company sale area in the Eastern Lassen Working Circle have been causing some anxiety to the forest officers concerned with the management of the sale, for it has been evident for some time that rather heavy losses were being incurred in stands which, under existing management plans, will be among the last to be logged. Arrangements have been made between the Forest Service and the Company for a modification of plans for logging operations, should insect losses justify it. Accordingly, the Office of Management of the Forest Service requested that the Bureau of Entomology make a quantitative survey of the area involved in the sale and furnish information concerning present losses and trend of the infestation. It is their intention to use the information in determining the advisability of changing plans for logging operations or in deciding what changes should be made in order to salvage as great an amount of timber as possible.

History of the Area

No previous quantitative survey of this region has ever been made, but a general reconnaissance of the area was made in September 1920 by Mr. J.M. Miller, who reported the following:

"The indications are quite pronounced that the forest north of Gray's Valley and surrounding Harvey Valley was visited by a vigorous epidemic not later than six or eight years ago. On some sites the amount of loss in the old centers is so great that there has been a marked opening-up of the stand, and in these openings reproduction is coming in rapidly. The decline of the infestation occurred at least some five or six years ago, and although there is still more infestation here than in other parts of the forest, it has not again assumed serious proportions. From Harvey Valley to Eagle Lake the infestation is fairly uniform and evenly distributed. It may be termed endemic, although heavier than in the McCoy Flat and Bogard regions."

The McCoy Flat referred to by Mr. Miller is not that dealt with in the present report.

The Harvey Valley area mentioned by Mr. Miller is still suffering from a heavier infestation than are most other parts of the Eastern Lassen Working Circle; and it is evident, because of the number of standing snags, that heavy annual losses have been experienced for several years past.

No control work has ever been carried on in this part of the Lassen National Forest, although recommendations for control work in areas south of those included in this survey were made in 1914 by Mr. Ralph Hopping and control work was done in those areas.

Survey Methods

Five half-section check areas were established in approximately typical stands, and a hundred per cent cruise was made of each check area. As the survey progressed it became evident that the intensity of the infestation, type of stand and quality of timber were extremely variable within the sale area, and that check areas combined with strip-count traverses would not supply sufficiently accurate data for the region unless an unusually large number of check areas were established and cruised. It was thought that better work could be accomplished and time could be saved by determining the general limits of areas having different intensities of infestation by means of extensive topographic survey methods, and finding the extent of losses in those areas by means of strip-cruise traverses, five chains in width. Each strip was subjected to a hundred per cent cruise. These traverses supplied definite information concerning the small centers of heavier infestation, and in general substantiated the information gathered by topographic methods concerning the boundaries of areas having different intensities of infestation.

The five check areas that were established involved a hundred per cent cruise of 1600 acres. Twenty-nine miles of five-chain strip-cruise traverse were surveyed, involving a hundred per cent cruise of 1160 acres, a total of 2760 acres being subjected to a hundred per cent cruise during the survey. Twenty-two miles of strip-count traverse were surveyed, involving 880 acres. Approximately 4.7 per cent of the total timbered acreage in the area was cruised.

The survey party consisted of R.L. Furniss and Houghton Durbrow, temporary field assistants in the Bureau of Entomology, with the writer. The period from September 17 to October 2 was covered in making the survey. The Bureau of Entomology supplied the necessary equipment and transportation and paid the salaries of the party personnel. The Forest Service paid the field expenses. The cost of the survey was as follows:

Salaries - - -	$298.08
Field expenses-	106.87
Total - -	$404.95

Description of the Area

The timbered areas of T 33 N, R 8 E, east of the Harvey Valley-Puls Camp road; T 33 N, R 9 E, and T 33 N, R 10 E, entire; T 32 N, R 8 E, exclusive of the west tier of sections; T 32 N, R 9 E, and T 32 N, R 10 E, entire; T 32 N, R 11 E, west of Eagle Lake; and the timbered area of Campbell Mountain, in the northeastern portion of T 31 N, R 9 E, were covered by the survey. The map accompanying this report shows the entire area included in the survey except the Campbell Mountain area and the small portion of T 32 N, R 11 E, west of Eagle Lake. No unusual developments were found in either of these areas. The area described above is approximately that included in the present Fruit Growers' Supply Company sale, except a part of the area in T 33 N, R 8 E, where the sale area includes only Sections 24, 25, 35, 36 and a portion of Section 26. The additional territory was cruised because of the evident artificiality of the sale boundary when considered from the standpoint of the existing infestation.

The topography of the region is moderately rough. Two main ridges are included in the area, one running west from Dow Butte through Ashurst Mountain to Harvey Mountain, the other south from Dow Butte through Cave Mountain and Little Antelope Mountain to Antelope Mountain. Logan Mountain and Crater Mountain are two more or less isolated peaks north and to the west of Antelope Mountain. The elevation ranges from about 5150 feet near Eagle Lake to about 7500 feet on Antelope Mountain, although the majority of the peaks have an elevation in the neighborhood of 7000 feet and the valleys are usually at an altitude of about 5700 ft.

Timber covers the mountains and ridges except for the occasional lava flows, brush fields and burned areas, and extends down into the valleys, which ordinarily carry little timber except on a few low, isolated knobs that rise above the general levels of the valley floors. The soil throughout the area is largely volcanic in origin, usually consisting of decomposed lava rock covering the old lava flows. The drainage of the area is chiefly to the east and south through Pine and Gordon Creeks.

The composition of the timber stands depends to a large extent on exposure and elevation. Yellow pine is the most important timber tree throughout the area, although in some places, as on the south slope of Harvey Mountain and on the higher elevations, Jeffrey pine is more abundant than yellow pine. Fig. 1 shows a typical mixed Jeffrey pine-yellow pine stand. On the slopes of some of the ridges sugar pine is fairly abundant, while white fir is the predominant species on many areas having a northern exposure. Incense cedar and juniper are present on some sites. Mature trees of Age Classes 4 and 5 predominate, and on favorable sites there is heavy reproduction. It is considered that the majority of the trees over the entire area are particularly susceptible to insect attack, and furnish excellent material for the development of insect epidemics because of their maturity and slow growth. Based on height classification, the greater portion of the timber is growing on Class III sites, the better pockets of timber on Class II sites, and the poorer timber on Class IV sites. Approximately 76,000 acres are timbered, bearing a volume of approximately 859,036 M.B.M., classed as western yellow pine. These figures do not include the cutover areas. This timber, at current prices of $4.00 per M, has a value of $3,469,000.

For convenience in describing conditions within the surveyed area it has been divided into the following units: Crater Mountain, Harvey Mountain, Gordon Creek, Cave Mountain, McCoy Flat, Brockman Flat and Logan Mountain. The boundaries of these units are shown on the map. The boundaries are not in all cases the logical ones for entomological units, but are of necessity drawn arbitrarily.

The several areas of heavier infestation discussed in this report are designated by letters on the map. This system was adopted to do away with the necessity for describing the extent and boundaries of each small local area of infestation when referring to it in the body of the report.

General Insect Conditions

The map accompanying this report shows the 1929 loss in pine timber within the area in a more or less specific manner and depicts the approximate boundaries and relative intensities of the local infestations. The 1930 losses, given in the discussion of conditions within each unit and in the tables, are estimates based on the assumption that approximately 70 per cent of the current season's losses will be discovered by a cruise made in September. The survey showed that, in general, the losses for 1929 and 1930 were less than 0.5 per cent over the greater portion of the area, and that the relatively small areas in which heavier losses were experienced reflect local conditions. It is significant that the areas of heavier infestation marked on the map as A,B,C,D,E,F,G,N and T are all on slopes having a southern exposure, while areas marked H,I,J,K,L,M,P,R and S are areas in which the rocks of lava flows have not yet been covered by a layer of soil sufficient to furnish good conditions for growth. It seems logical to assume that, in the case of the first group of areas listed above, climatic conditions affecting the trees and insects may have favored the latter and resulted in greater vigor of attack, while the poor growing conditions afforded by the soil of the lava flows common to the second group of areas may have resulted in a greater susceptibility of the trees to insect attack.

The proportionate losses caused by the various species of insects are somewhat different in the different areas, depending on the site and the composition of the stand. In general, Dendroctonus monticolae Hopk. has caused but slight loss in either sugar pine or western yellow pine. A slight loss in western yellow pine was also experienced from Ips emarginatus Lec. The greater amount of loss occurring in the area is caused by Dendroctonus brevicomis Lec. in western yellow pine and Dendroctonus jeffreyi Hopk. in Jeffrey pine. Flathead borers have been responsible for a considerable loss, chiefly on the poorer sites, while the fir engraver beetle has caused some loss in white fir, notably in the stand found near the top of Logan Mountain.

There is a general trend within the entire area indicating that the infestation is increasing. This increase has not yet assumed a serious aspect over the greater portion of the region, for in general the losses remain below or near 0.5 per cent of the stand. In some of the smaller areas reflecting local conditions, however, the infestations are apparently assuming serious proportions. These infestations are of two types, which may be characterized as follows:

In that group of areas having an unfavorable site and poor growing conditions in common, we find infestations in both 1929 and 1930 that are causing losses up to and over 2.0 per cent of the stand. The character of these infestations is not alarming, however, for there is no grouping of insect-attacked trees--i.e., no vigorous attack. Instead, the process appears to be one of killing mature, decadent, weak or otherwise susceptible trees. The actual amount of loss, represented in figures as percentage of stand, is great enough to characterize the infestation as epidemic; but the type of attack, lacking as it does the vigor and initiative of the usual epidemic, can scarcely be considered more than endemic. The process in these areas is merely a weeding-out or harvesting which, because of unfavorable growing conditions and susceptibility of the stand, results in heavy losses.

In those areas having an exposure to the south in common, we find different conditions. However, it cannot be said that all the areas of this group show these conditions. Thus, in Areas G and N the infestation remains purely endemic in character. In the other areas included in this group the insects are waging an active and vigorous attack, and trees that are not weakened, although they are to be classed as susceptible, are succumbing. There is a tendency for grouping of attacked trees to occur and losses are high. Thus, both in character of attack and amount of loss the infestation in this group of areas can be considered an epidemic type. Unlike most epidemics, however, losses have been occurring within these areas at about the same rate for some years; apparently there has been no sudden building up and subsidence of attack. But it is felt that the situation is dangerous because of the active role the insects are taking in the depletion of the stands.

It may be considered that losses in the first group of areas discussed above are due to the character of the stand, while those in the second group are due primarily to the initiative of the attacking insects. Because of this it is felt that, although losses will probably continue within the first group of areas, there is little danger, under existing conditions, that there will be any extreme changes. In the second group of areas it is felt that we face the possibility that the infestation may flare up at any time into a true epidemic, with resultant losses.

The 1929 and 1930 losses in pine timber are given for each unit in Table I. The 1929 losses are calculated directly from cruise data. The cruise data concerning 1930 losses are considered as 70 per cent of the total losses, and calculations are made accordingly.

Insect Conditions by Units

Crater Mountain Unit

The boundaries of this unit are as indicated on the map accompanying this report. Yellow pine is the predominant species and nearly pure stands, or yellow pine mixed with white fir, occur in a belt surrounding the mountain and extending part way up the slopes. This type of stand gives way to one of Jeffrey pine, and to fir as the summit of the mountain is approached. On the north and east sides of the mountain lava slides, on which there is no timber cover, occupy a considerable acreage. Logging operations have been conducted on the north and east slopes of the mountain during the past season. The areas colored blue on the map indicate the boundaries of these operations.

The unit as a whole is in excellent condition, and shows a loss for the last two years of less than 0.5 per cent of the stand. There is no evidence that losses in the past have been excessive, and present losses can be considered normal with the exception of those in one small area marked "T" on the map. In that small area losses in 1930 were over 500 per cent greater than in 1929, considered on a volume basis, and nearly three times as many trees were killed in 1930 as in 1929. Unstable conditions exist; but as the area is small, as losses still remain below 1.0 per cent of the stand, and as the surrounding stands exhibit no infestations of the same type, it is felt that no action is necessary for the present. The area should be watched, however, and steps taken to protect surrounding timber should conditions warrant it.

A check area was established in this unit and strip-count traverses were run in determining the infestation. Data from the check area are given in Table II.

Harvey Mountain Unit

The boundaries of this unit are as indicated on the map. It is evident that there are no natural barriers to separate this unit from the Gordon Creek Unit to the east, or from the country lying to the north and west. The logical north boundary of the unit is the ridge extending from Harvey Mountain through Ashurst Mountain, thence northeast to Gooch Mountain and excluding the north slopes; but as the township line between T 33 N and T 34 N is the boundary of the sale area, the north slopes have been included in the unit. The timber is largely a mixed stand of western yellow pine and Jeffrey pine, with fir predominant on the north slopes. The infestation is light over the greater portion of the unit, but the band of timber lying south of the ridge and having an exposure to the south shows a heavier infestation of varying intensity. Table I shows the estimated yearly losses in this unit to be but 0.51 per cent of the stand in 1929 and 0.59 per cent in 1930. These losses do not appear to be excessive; but when it is realized that slightly more than one-fourth the area (approximately 9 sections) suffered nearly two-thirds of the total losses for the entire unit in those two seasons (842 M.B.M. in 1929 and 1069 M.B.M. in 1930), another aspect of the situation is presented.

The areas in this unit that are shown on the map as carrying an infestation of less than 0.5 per cent--except the small area marked "D"--can be left out of consideration, as the losses during 1929 and 1930 were actually far below that figure.

In the remaining areas, A,B,C,D,E and F, the infestation as discussed under "General Insect Conditions" is of the sustained epidemic type. Eastimated losses for each of the above areas are given below. The estimates are taken from data supplied by strip-count and strip-cruise traverses.

Area	1929	1930	
A	0.54%	0.62%	(1930
B	0.68	1.8	(
C	1.86	2.5	(losses are
D	0.39	2.7	(
E	1.17	1.4	(estimated
F	0.36	0.83	(

The above figures show the present center of infestation to be in Areas C, D and E. In Areas A and B it is evident that the infestation has existed for some time and that losses have been heavy. The evidence offered by the large numbers of snags is supplemented by that supplied by data taken from Section 23 in connection with a heptane experimental study. In that section losses since 1926 have been as follows:

1926 - -0.68%
1927- - 1.24
1928 - -1.34
1929- - 1.26
1930 - -1.51 (estimated)

Apparently in Area B the infestation is increasing in intensity, but in A it appears to be maintaining a steady rate. In Area C the infestation does not appear to be as old as in B, although the losses are higher. Few snags are present, and there is a tendency for the insect-infested trees to be in groups. In D, E and F the infestation is in an epidemic condition, less so in the last named than in the others; but the outbreak is relatively new and apparently has not been in evidence for more than a few seasons.

The infestation in this group of areas is spotted and extremely variable. The losses are not entirely due to D.brevicomis Lec., for a large portion of the stand is Jeffrey pine. The Jeffrey pine beetle is also apparently playing an important role in the epidemic, for several groups have been discovered which were the work of the insects in but one or two seasons. Fig. 2 is a photograph showing one such group situated in Area D. All except one of the dead trees in this group were killed in 1928 and 1929. Another group was found nearby in which eight trees had been killed; one was killed by the Jeffrey pine beetle in 1929 and the remaining seven carried a 1930 brood.

The causes of the infestations in this group of areas are not evident. It may be that the maturity and slow growth of the timber are factors of susceptibility contributing to the heavy infestation, but many of the relatively uninfested portions of the region also have a timber cover of the same type. The climatic conditions accompanying an exposure to the south--a character common to the group of infested areas in this unit--may introduce factors favorable to the insects and thus contribute to the production of a heavy infestation. However, a few other areas in the region covered by this survey are subjected to the climatic influences associated with a southern exposure, yet are not suffering from a heavy infestation.

It is impossible to foretell future developments in these areas. I should expect, however, considering the past history of the area and the present condition of the stand, that if there is any change it will be toward a heavier infestation.

It appears advisable, considering the above facts, to suggest that some action be taken to salvage as much of the remaining timber as possible. It is doubtful if control measures would be practical, both because of the excessive cost and of the fact that the loss has evidently been above normal for the area since 1914, and thus must be due to some deep-seated cause that control work will probably not eliminate. Control, through utilization, offers itself as the more practical method.

The data secured from the two check areas established in this unit will be found in Table II.

Gordon Creek Unit

This area, which carries a fine stand of mature yellow and Jeffrey pine, has a relatively light insect infestation. Strip cruises and the check area data (given in Table II) failed to show any infestation of importance.

The 1929 losses ranged from practically nothing to 0.54 per cent of the stand for individual miles of traverse, and 1930 losses are about the same. Area G shows a somewhat lighter infestation than the corresponding areas along the belt of infestation to the west. In the heavier infestation marked "H" losses have been and still are in the vicinity of 2.0 per cent. The fact that the stand on this area is on a lava knoll and has very poor growing conditions would indicate that the site is a major cause of the heavy infestation. In the small area marked "I" there was a sudden flare-up during this last season. The stand in this area is also growing on a lava slide, and the heavier infestation is no more than can be expected. No apparent spread from these areas to surrounding timber has occurred.

Cave Mountain Unit

Conditions in this unit are a composite of those in the Gordon Creek and in the Brockman Flat Units. The timber stand is predominantly western yellow pine, with a small amount of Jeffrey pine, some sugar pine and fir. It is distinctly an east-slope type of timber and is bordered on the east by sagebrush. Lava flows are scattered through the unit, as are pockets of very good soil. Accordingly, we find pockets of good timber distributed through the relatively poor type of stand. Areas of heavy infestation more or less coincide with the areas supporting stands of poor-quality timber.

No check areas were cruised in this unit, but the strip-cruise traverses revealed a 1929 loss of from practically nothing to 0.33 per cent of the stand in individual miles of strip within the area shown on the map as having an infestation of less than 0.5 per cent. In the same area estimated losses for 1930 range from practically nothing to 0.84 per cent of the stand. In the area marked "J" 1930 losses are about 2.8 per cent; in "K" they are approximately 2.57 per cent, and in "L" the 1929 loss was about 2.36 per cent and the 1930 loss is estimated at about 1.7 per cent. In Area M, which is a lava flow, a loss of about 2.74 per cent of the timber occurred in 1930. In the area marked "P" on the map losses of from 0.55 to 0.64 per cent were experienced in 1929, and 1930 losses are from 0.64 to 1.00 per cent.

All the areas of heavier infestation within this unit are associated with poor sites and the infestations are not truly epidemic in character, although in the amount of loss they are within that classification. It is not felt that, unless present conditions change, there is any immediate danger of a flare-up. It is evident, however, that the relatively high rate of loss will continue. For that reason it would probably be advisable to salvage what timber remains as soon as possible. Estimates of insect losses in this unit are given in Table I.

McCoy Flat Unit

This unit includes only those basins in which Penitentiary Flat, Antelope Flat and McCoy Flat are situated. There are no distinct barriers separating it from those units around it, but also there are no distinct resemblances to any other unit that would link it to one of the others. The infestation within the unit was extremely light in 1929 except in those areas marked "N" and "R" on the map, in which losses ranging from 0.38 to 0.55 were experienced. In the latter unit the 1930 loss is estimated at about 1.47 per cent of the stand, indicating a distinct increase. In "N"

the 1930 losses decreased to about 0.31 per cent of the stand. Both these areas of heavier infestation are exposed to the south but have little in common, as regards type of infestation, with those areas discussed under the Harvey Mountain Unit having a similar exposure.

Under existing conditions no immediate action appears to be necessary in this unit. The estimated losses for the unit are given in Table I.

Brockman Flat Unit

This unit is bounded on the north by the Eagle Lake Road and on the south by the national forest boundary. It extends from Eagle Lake on the east to the top of the ridge extending from Antelope to Cave Mountain on the west. The timber stand is largely western yellow pine, with Jeffrey pine, sugar pine and fir on the slopes near the western boundary of the unit. There is a definite zone of heavier infestation, the limits of which follow the boundaries of a lava flow that covers a considerable portion of the flat. A strip count through this unit showed that on the basis of existing timber estimates, which show a stand of but 5,000 B.M. per acre, the infestation for both 1929 and 1930 was from 1.1 to over 2.0 per cent. The losses caused by insects outside this area of heavier infestation were negligible.

A check area was established in the east half of Section 28. Data from it appear in Table II. Although the losses occurring in this half section are low, taken as a whole, the presence of the area of heavier infestation, which occupies a smaller part of the check area than is shown on the map, is noticeable when the field cruising map is consulted.

The infestation in this unit is of the same type as that found in the Cave Mountain Unit. As the greater portion of the infested area is considered an optional logging chance, and as the infestation is not vigorous although the losses are relatively heavy, the only action that can be suggested is to salvage what timber remains as soon as possible.

Logan Mountain Unit

Practically the entire unit has been cut over, about 1,000 acres remaining uncut near its northern boundary. This timber is experiencing a light loss due to insects. The area marked "V" on the accompanying map carries a thick stand of mature and immature white fir. The fir engraver beetle caused serious losses during 1929 and 1930, chiefly attacking the young trees and causing the stand to appear as if swept by fire.

Supplementary Notes

The timber on Campbell Mountain, which is largely fir and yellow pine, was found to have an endemic infestation, conditions existing in the area resembling those found on Crater Mountain. As the greater portion of this timber is patented and no great loss is being experienced, it was felt that a detailed consideration of the area was unnecessary.

The basin north of Gordon Creek and extending north to Gooch Mountain and Slate Mountain, would normally be considered as a part of the Gordon Creek Unit. The area, however, is not included within the sale area. The insect infestation in this basin is essentially the same as that reported for the Gordon Creek Unit.

Discussion

The survey revealed that no great general increase in insect losses occurred over the entire area in 1929 and 1930. A slight general increase occurred, however, and marked local increases were noted. The physical features of the localities in which these marked increases occurred indicate that the increases may be due to climatic factors favorable to the attacking insects or to low resistance of the timber to insect attacks, due to unfavorable sites and growth conditions.

There is no means of telling what will be the future course of the infestations on those areas having unfavorable sites and growing conditions. Apparently the losses have been occurring at the same high rate for some time past and no great enlargement of the infested areas has recently taken place. In view of this it is probable that the infestation will continue at its present high rate in the future unless the present rather stable situation is unbalanced by some unpredictable change.

It is believed that critical conditions exist in the band of infestation extending along the south slopes of the Harvey Mountain-Ashurst Mountain Range. The reasons for this state of affairs are obscure, for the topographic features and soil conditions of the infested areas appear to be favorable to tree growth, although the maturity of the stand is considered as evidence of susceptibility. Nevertheless the epidemic character of the infestation and the increase in insect losses indicate that unstable conditions exist. When it is realized that the increases for 1930 are probably greater than estimated because of the fact that Jeffrey pine, a species in which only a portion of the attacked trees fade during the season of attack, is the predominant species in these areas, the possible extent of the flare-up is increased. Heavy annual losses have been continuous in portions of the band of infestation for at least four years, and there is no evidence indicating a tendency for the losses to decrease. Although the losses have not been extreme, and even now are in the vicinity of 2 per cent for the band of infestation as a whole, the aggregate losses of a few years loom up as something to be considered. In addition, the infestation has shown a tendency to spread in the past, and present indications are that a larger area will be included in the infested district each year. There is no typical epidemic of bark beetles with which to deal--the type in which the infestation suddenly increases and after a few years decreases to an endemic infestation--but rather there is apparently a continuous, sustained and spreading heavy endemic-to-epidemic attack that has a telling effect on the stand. The causes of these losses, which were heavy in 1912 or 1914, were greater than normal in 1920 and have been continuous since 1926, must be deep-seated. In view of this it is apparent that some action, preferably involving the utilization of the timber, should be taken to prevent a further reduction of the stand. These areas present the most pressing entomological problem in the sale area.

Conditions in the small center of infestation on Crater Mountain at the present time do not warrant action. A watch should be kept on this area, however, and if the infestation spreads to the relatively uninfested areas surrounding it, action should be considered.

Fig. 1. Typical yellow pine-Jeffrey pine type stand on Harvey Mountain, Lassen National Forest. The photo shows the mature, park-like stand typical of the area and also a small opening containing old insect-killed trees. Reproduction is thick in openings of this sort, which are scattered throughout the area. (Photo 7404c; K.A. Salman)

Fig. 2. Group of Jeffrey pine on the southwest slope of Ashurst Mountain, killed by Dendroctonus jeffreyi Hopk. in 1928 and 1929. Only one tree containing a 1930 brood was found in this group, although a similar group nearby consisted of eight trees bearing a 1930 brood. (Photo 7402b; K.A. Salman)

TABLE I

Estimated Losses for 1929 and 1930

Unit	Acres	Vol.Stand M.B.M.	Av.Vol. per Tr.	1929 No.Trees	1929 Vol.MBM	1929 % Stand	1930 No.Trees	1930 Vol.MBM	1930 % Stand
Crater Mt.	17,900	217,699	1,080	1,700	756	0.35	890	961	0.44
Harvey Mt.	21,660	276,406	990	1,400	1,386	0.50	1,650	1,634	0.59
Gordon Creek	7,280	120,511	1,230	310	381	0.32	360	445	0.37
Cave Mountain	10,460	84,457	750	580	435	0.51	520	390	0.46
McCoy Flat	5,960	64,099	750	300	225	0.35	430	255	0.40
Brockman Flat	11,740	82,452	975	390	380	0.46	520	505	0.61
Logan Mt.	1,000	13,412	800	50	40	0.30	70	56	0.42
Totals	76,000	859,036		3,730	3,603		4,440	4,246	
Averages			940			0.40			0.46

TABLE II

Losses on Check Areas, 1929 and 1930[1]

Unit	Location						1929 Losses			1930 Losses		
	Tp. N	R. E	Sec	Part Sec.	Acres	Volume M.B.M.	No. Trees	Vol. BM	% Stand	No. Trees	Vol. BM	% Stand
Crater Mt.	32	8	21	W½	320	4,709	10	6,910	0.15	27	39,580	0.84
Harvey Mt.	33	8	24	N½	320	3,487	56	65,170	1.87	31	30,790	0.89
Ashurst Mt.	33	9	10	S½	320	5,391	21	19,550	0.36	51	45,000	0.83
Gordon Cr.	33	10	9	W½	320	5,045	13	9,710	0.19	11	18,840	0.37
Brockman Fl	32	10	28	E½	320	4,328	16	13,590	0.31	19	20,800	0.49

[1]Estimated considering 1930 losses cruised as 70% of total

EASTERN LASSEN WORKING CIRCLE

1930 SURVEY OF INSECT LOSSES

LASSEN NATIONAL FOREST, CALIFORNIA

LEGEND

UNIT BOUNDARIES — · — · — CHECK AREA BOUNDARIES ———

FIR TYPE TIMBERLESS CUTOVER OR BURN

PERCENT OF STAND KILLED IN 1929

0-0.5 % 0.5-1.0 % 1.0-2.0 % OVER 2 %

SCALE: 1 INCH = 1 MILE

STRIP CRUISES - - - - - - - - STRIP COUNTS — - — - —

R 8 E R 10 E

T 33 N

T 32 N

GORDON CREEK UNIT

HARVEY MT. UNIT

CAVE MT UNIT

McCOY FLAT UNIT

LOGAN MT. UNIT

BROCKMAN FLAT UNIT

CRATER MT. UNIT

HARVEY MT.

ASHURST MT.

DOW BUTTE

CAVE MT.

LOGAN MT.

CRATER MT.

ANTELOPE MT.

A B C D E F G H I J K L M N P R S T V

R 8 E R 9 E R 10 E